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"THEN I ASSUME YOU'RE GOING TO BE PRETTY INFLEXIBLE IN THIS SALARY DISCUSSION, McDERMOTT."

1986 SALARY SURVEY

ALSO: DAIRY INGREDIENTS

FOOD ENGINEERING

COVER STORY

While everyone would like a little more money in their paycheck, the figures from this year's salary survey indicate that food industry personnel are not doing all that badly.

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This month's Report discusses the problems created by an increasing number of product liability suits with increasing award amounts; a study on the benefits of using on-farm ultrafiltered milk in cheese processing; and corporate news from the industry.

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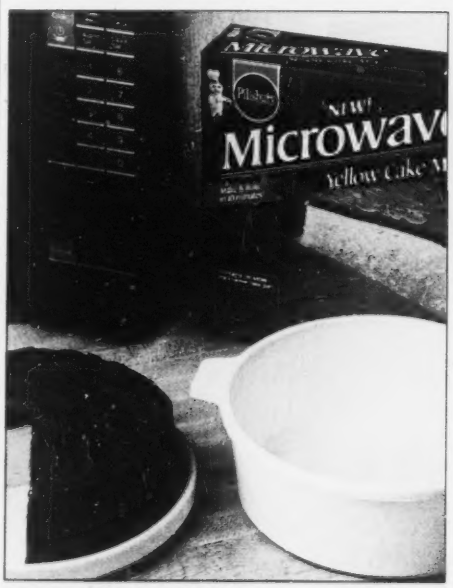

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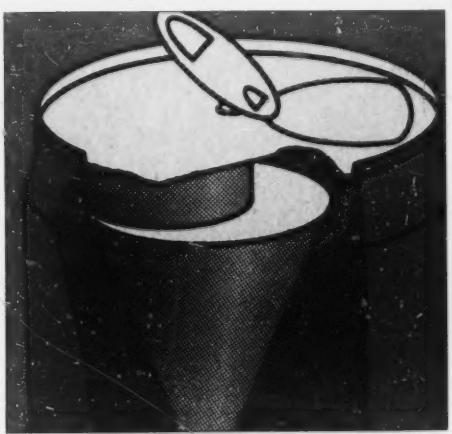

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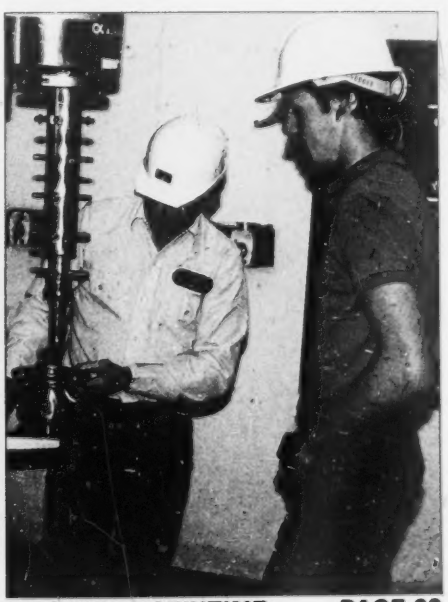

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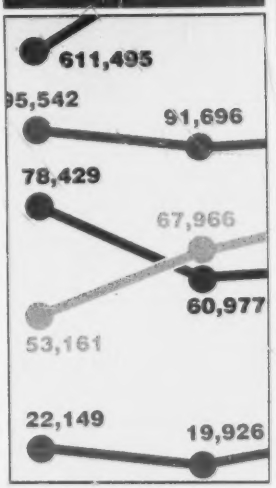

Special Emphasis

EXPANDING USES OF MILK PROTEINS:
Food scientists are producing new dairy ingredients, which are aiding food processors in the engineering of new food products.

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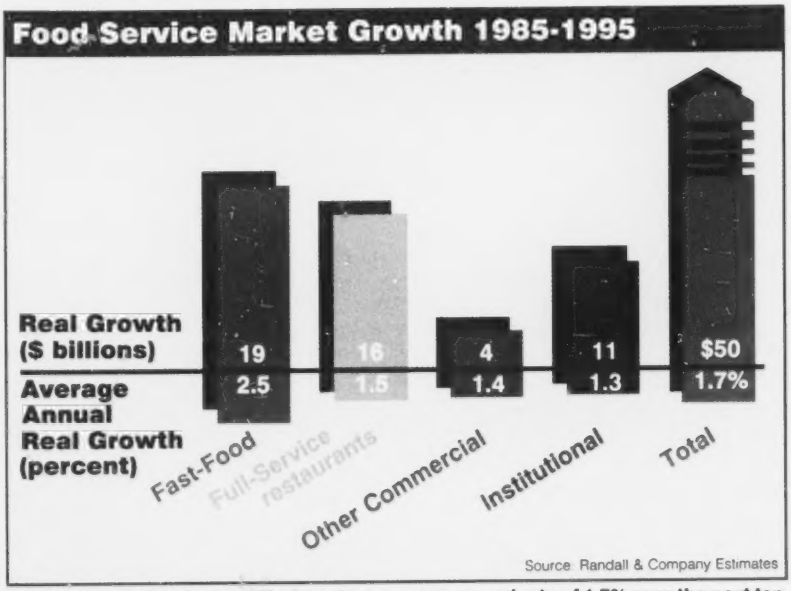
The Food Service Market: an opportunity for real growth



The food service industry will grow at an average annual rate of 1.7% over the next ten years, with real growth of $50 billion.

The food service market will increase at an average annual rate of 1.7 percent real growth through 1995, to $325 billion, providing as good a growth opportunity as retail sales. Randall & Co., Los Altos, CA, estimates that both the food service and retail food market segments will grow by $50 billion in the next decade, with food service reaching a 43 percent share of market.

Coming opportunities

Randall & Co. says the coming decade will present opportunities for:

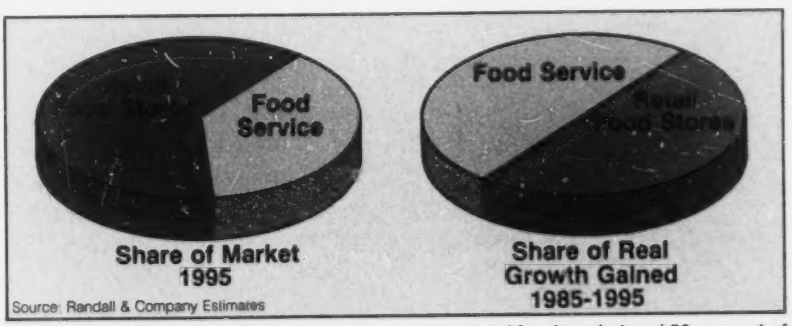
- Office park food courts offering retail and subscription menu plans, possibly subsidized by employers;
- Cuisine naturelle, with many finer restaurants adjusting menus to reflect increasing customer interest in natural and healthy foods;
- Health food restaurants and cafes, offering upscale items such as fresh salads, fresh homemade soups, lean meat specialties, fresh fish and poultry dishes, etc., catering to a growing segment of the population;
- Food emporiums, as in major European cities, where wide assortments of fresh and prepared food products and food services can be purchased;
- Upscale fast-food establishments with upgraded menus, service styles, and ambience, catering to maturing baby boomers;
- Mobile food service using specially equipped vans with full production and service capabilities;
- Scaled down and mini food service units to accommodate micro-segmentation of customer markets.

If your company is not positioning product for food service sales, then it is not only ignoring almost half of the entire food product market, it is ignoring potentially a very lucrative market. Food service products are generally packaged in institutional sizes. This translates to lower per unit packaging costs. Labeling costs are also lower, both because of package size and because the need for eye-catching consumer product label design is circumvented. Larger unit size also translates to lower handling costs. Another major cost that is eliminated is the need for consumer advertising.

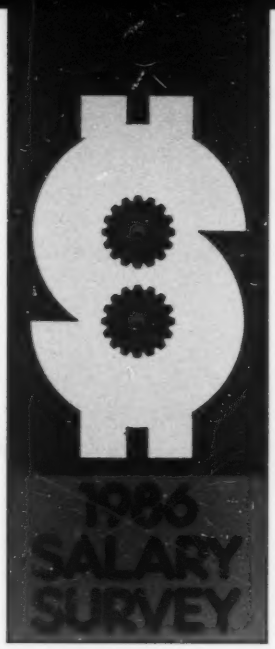
Packaging for food service

Packaging for the food service does not simply mean No. 10 cans anymore. There are several recent packaging methods that lend themselves to institutional sizes. Shelf-stable institutional retort pouches and steam table trays have been developed by military and space food service programs, laying the groundwork for commercial applications. Controlled atmosphere packaging can also be utilized to keep foods fresh for longer periods of time. Meals can be prepared fresh, then held under a gas mixture designed to hold that fresh-cooked taste and appearance for up to several days. Master packages can be used to keep several individually packaged meals in a controlled environment. Controlled atmosphere packaging *does* require refrigeration. Aseptic packages (which do not require refrigeration) are being developed in sizes large enough for food service use. Bag-in-box designs are ideal for the volumes required for food service. Bags-in-boxes can also eliminate the problems of returning and cleaning spent containers.

The food service market is expected to reach $325 billion by 1995. Providing an increased potential for manufacturers to produce higher value-added products, food service is a market you can't afford to ignore.



The food service sector will reach 43 percent of the total food market and 50 percent of the real growth recorded by 1995.



FOOD SALARIES STAY AHEAD IN 1986

While everyone would like a little more money in their paycheck, the figures from this year's salary probe indicate that you're not doing all that badly.

There are two burning questions that just about everyone asks themselves: How does your salary compare to others in your job category? And did you get a raise this year? For food industry personnel from top executives to folks on the line, the answer is found each December in *Food Engineering's* Annual Food Industry Salary Survey.

FE's survey, performed by Chilton Research Services, is designed to provide a cross-section of food industry salaries. The survey is weighted by title, geographic region, size of company, and a number of other variables to reduce the margin of error. Here's how it works.

Each year, 8,000 individuals representing all areas of responsibility in the food industry are asked to reveal their annual wage, whether or not they've received a raise this year, and how large that raise was. The questionnaire also asks for the individual's opinion on a number of questions regarding morale – such as "Do you feel optimistic or pessimistic about your future career?," or "Do you feel the quality of life in the work place is improving or worsening?"

This year, 1,378 respondents told *FE* how they were doing. And, for the most part, they were doing better than in 1985. Where specific questions were asked – about current attitudes, for example – many chose not to answer and others had more than one answer for us. So, in some cases, the total number of answers doesn't add up to 1,378.

Where salaries are concerned, however, the respondents told all, permitting us to draw conclusions about the median salaries for some specific areas and skill levels. For example, you're likely to make more working with candy and spaghetti, where the median salary is $44,000 per year, than with meats and seafood, where the median is $39,000. Your experience in the food industry has a cash value, too, represented by a difference of $15,000 between the median salary for a beginner and somebody with 30 or more years of experience.

While salary surveys often discuss Average, Mean and Median salaries, only the Median is used here because it reflects the facts more accurately – the Median represents a true midpoint.

Here, then, are the numbers for 1986.

A look at the big picture

In late summer, says Chilton Research, the average (seasonally adjusted) U.S. wage was $31,808, unemployment was down, but so was consumer spending. Personal income was rising at a rate of 4% per year, and the cost of living index was up slightly. Meanwhile, industrial production and plant capacity were down and inventories were up. GNP was expected to drop, too, along with after-tax corporate profits. Depending on your viewpoint, the overall picture was either one of stability or stagnation.

Prospects for the food industry, however, were somewhat brighter. About 75% of the responses to *FE's* survey this year indicate that business – and job security – is good and getting better. And the salary figures tend to back up this point of view. The Median salary for the industry this year was $41,000, and all job categories appeared to be doing well. About two-thirds (65.3%) of the food technologists surveyed, for example, reported salaries equal to or above the national average – and 47.2% were earning more than $35,000 per year.

A food technologist in Oregon who makes $34,400 sums up conditions for many other technical people. "This year's salary increase is an important breakthrough for

KEVIN J. HANNIGAN, Features Editor

product development at our company," he says. "The last three years have been a slow process of bringing R&D salaries into the range appropriate for our responsibilities."

But not everyone is doing well. "Many companies seem to be giving smaller raises due to economic reasons," says a quality control manager in Kentucky who makes $56,800 after 17 years. "This unfortunately has affected companies that are making record sales and profits."

Still, pay raises were the rule. Of the 1,378 respondents to this year's survey, 1,087 (78.9%) reported salary increases. And the largest number of increases (45.1%) were in the 5-8% range. Only about 15.7% (216 respondents) said that their salaries hadn't changed from 1985. And only 17 respondents reported a decrease.

The exception to the rule was managers earning $45-60,000 per year, who were more likely to get a raise and less likely to take a pay cut. This group includes plant managers, engineering managers, packaging managers, sales managers and technical directors.

While most of you got a raise this year, salary increases were smaller – and fewer – as the salary level rose. An engineering manager in Texas, who makes over $60,000 per year, reports: "This year, our company froze all salaries due to profits not being as budgeted." And a marketing director for a New Jersey beverage plant, citing low increases, says: "I expect a higher turnover among younger middle management employees." His counterpart at a Maryland firm agrees, saying: "It's damned difficult to make significant advances without moving from one company to another."

Extra income varies widely

In addition to a regular paycheck, you also may have received some other forms of earned income this year. Of the 1,378 respondents, for example, 52.1% say that they receive extra compensation such as bonuses, cash awards, incentives, etc. But 43.8% report that they don't receive any extra compensation. Men did better than women in this regard, with 53.8% of the men reporting some form of extra income compared to only 39.2% of the women.

"Our company believes salaries should be on the low side," says a quality control manager in Washington, "but a generous bonus program rewards people with incentive." However, at a multiproduct manufacturer in New York State, says a project engineer, bonuses differ in kind. "Christmas bonus is the same for everybody up to the middle management level," she says, "and it's been $300 for many years. Higher levels get bonuses based on performance."

Based on the survey results, women appear slightly more likely to receive cash awards and bonuses, while men are slightly ahead in terms of profit sharing, stock options and incentives. While very few men

(Continued on page 46)

TABLE METHODOLOGY

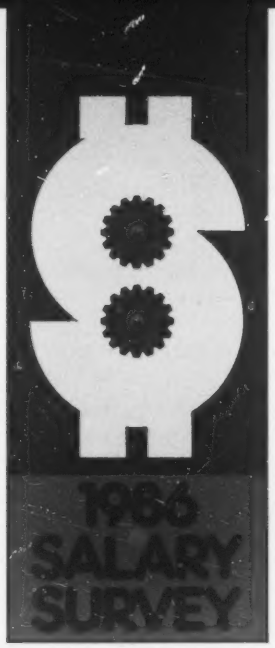
A. The tables in this article are designed to be read from left to right. For example, in the large table below that lists salaries vs. job titles, the chart will tell you that of the Presidents surveyed, 6.4% made $45-49,999, 3.2% made $55-59,999, and so forth.

B. In preparing the tables, we have eliminated from consideration sample cells too small to support a valid projection.

C. You will notice that percentages rarely add up to 100%. That is because of either multiple responses to a given question, no answer or "don't know" answers, or answers that were so diverse as to be classified as "other".

SALARY RANGE BY JOB FUNCTION

	Under $25,000	25-29K	30-34K	35-39K	40-44K	45-49K	50-54K	55-59K	60-69K	70K or More
President	10.6%	4.3%	3.2%	4.3%	11.7%	6.4%	3.2%	3.2%	7.4%	45.7%
Vice President	5.0	2.0	7.1	3.0	8.1	3.0	11.1	6.1	17.2	36.3
Technical Director	4.8	4.7	8.2	14.1	10.6	14.1	9.4	8.2	18.8	7.1
Plant Manager	5.9	9.3	11.9	21.2	9.3	16.1	5.9	5.1	11.0	3.3
Project Engineer	2.1	5.7	17.7	27.7	12.8	16.3	12.1	2.1	2.8	0.7
Production Supervisor	9.1	21.8	27.3	23.6	14.5	1.8	—	1.8	—	—
Engr./Pkg. Manager	1.5	5.3	7.5	12.0	19.5	13.5	15.0	7.5	10.5	7.6
Department Manager	3.4	22.4	13.8	20.7	13.8	12.1	5.2	3.4	1.7	3.4
Food Technologist	21.7	13.0	18.1	15.9	18.8	5.1	2.9	2.9	0.7	0.7
Quality Control Manager	12.1	19.4	16.9	12.9	16.9	7.3	5.6	4.0	3.2	1.6
Mktg/Sales Manager	3.9	11.8	13.7	7.8	21.6	13.7	9.8	4.9	6.9	5.0
Purchasing Manager	24.3	13.5	14.9	10.8	16.2	8.1	4.1	—	4.1	4.1
Other	11.4	8.3	19.1	10.2	10.2	11.5	5.7	7.0	6.4	10.1



(5.3%) claimed either a company car or a vehicle allowance as extra income, no women claimed any at all. And only one respondent in the $30-60,000 range claimed such an allowance. Of those who get it, 47.2% were in the $60,000-plus range.

The incentives mentioned were most likely performance-related perks such as vacations for meeting sales objectives. And car allowances tend to be related to sales activities. Only 1.0% of the extra income reported was overtime. And that, too, is a sore point. A project engineer for a large California bottler complains that "Floor washers with less responsibility receive higher salaries via overtime." And a packaging manager for a Pennsylvania bottler states: "When I started with my company as a supervisor, it took six years to make the same as the union employees under me. But do I really make more? They work eight hours a day with 70 minutes for breaks. I work 10-11 hours with no time for breaks. Is this fair?"

Quality of life improving

The relationship of employee morale to productivity has been proven over and over again, so it's no surprise that most progressive firms are trying to improve the working environment. Apparently, this trend also has taken root in the food industry.

When asked if the quality of life in the workplace was improving, staying the same or worsening, for example, 60.9% of our survey respondents said that it was improving. Only 5.4% felt it was about the same, and another 27.4% said it was worsening.

Of those who saw the quality of work life improving, the reasons given were varied. A vice president of manufacturing notes: "Our office has been renovated and the general atmosphere is more pleasant." And a project engineer who makes $36,200 after 12 years says things are better because "The company just built a new physical fitness center on the premises."

Of the 27.4% who saw the quality of life in the workplace worsening, the reasons cited included: low morale, no job security, mergers and acquisitions. Another reason for worsening conditions, cited by 16.2%, was too much work and fewer people. Staff reductions over the past few years have resulted in greater responsibilities for many food people. Thus, although they may be making more this year, say a large number of our respondents, they're working harder for it. In general, this trend to increased responsibility was more of a burden for those earning $25-40,000 per year.

A food technologist making $32,000, for instance, says his responsibilities normally were R&D. Now, he's involved with quality assurance and procurement. And a production supervisor for a medium-sized candy manufacturer in Pennsylvania reports that he has more responsibilities in all areas – quality assurance, safety, OSHA, FDA and corporate inspection, GMP, yields, held product, sanitation, etc.

Of the 60.0% reporting increased responsibilities, 30.2% said that a heavier work load was largely the cause. Another 39.3% gave no explanation. Of the 30.5% remaining, major reasons cited for the increase in responsibilities included: received a promotion; company growth; an increased or reduced staff; more new product development work being done; the company had reorganized (this also was the largest cause for a decrease in responsibility); increased regulatory compliance; use of new technology; and greater travel.

How we view the future

Your opinion of the quality of life in the workplace also shows that, in general, morale is good. Another measure of morale is how an employee feels about the future. And, once again, the signs are positive.

This year's respondents were enthusiastic about the future, with 75.3% of the total optimistic and only 19.4% pessimistic. An engineering manager in a very large Connecticut bakery, for instance, says: "The company is expanding and demand for my particular talents (developing specialized machinery) is quite high." And a food technologist in Oregon, who makes $34,400 after eight years, reports: "Fast growth is causing more recognition of R&D impor-

(Continued on page 49)

Median salaries by Food Industry experience

Years Experience	Median Salary
0-5 years	$34,000
6-9	36,000
10-14	41,000
15-19	46,000
20-24	48,000
25-29	48,000
30 or More	49,000

SOURCE: Food Engineering 1986 Salary Survey

FOR FOOD INDUSTRY WOMEN, PAY IS IMPROVING—SLOWLY

Salary levels by gender

Annual Salary	Male	Female
$70,000 or More	95.2%	3.2%
60-69,000	96.9	2.1
55-59,000	92.1	6.3
50-54,000	96.1	2.9
45-49,000	94.4	4.2
40-44,000	92.3	5.6
35-39,000	87.1	11.3
30-34,000	83.7	14.2
25-29,000	78.3	20.3
Under 25,000	58.5	41.5
Total Respondents	1200	158

SOURCE: Food Engineering 1986 Salary Survey

Industry experience versus gender

Total Experience	In General Industry (% in range)		In Food Industry (% in range)	
	Male	Female	Male	Female
0-5 years	65.7%	33.6%	75.1%	4.1%
6-9	73.2	24.2	78.0	19.9
10-14	85.3	13.5	87.5	11.0
15-19	93.8	5.8	94.7	4.8
20-24	93.6	5.1	93.8	3.8
25-29	95.1	3.1	95.0	4.1
30 or More	95.6	2.4	97.2	1.1
Total Responses	1200	158	1200	158

SOURCE Food Engineering 1986 Salary Survey

How we feel about the future

	Optimistic	Pessimistic	Neither
Male	75.1%	19.3%	1.5%
Female	76.6	20.3	1.3
Total Surveyed	75.3	19.4	1.5

SOURCE: Food Engineering 1986 Salary Survey

Salary change versus gender

	Increased	No Change	Decreased
Male	77.8%	16.4%	1.3%
Female	87.3	10.1	0.6
Total Surveyed	78.9	15.7	1.2

SOURCE: Food Engineering 1986 Salary Survey

Job responsibilities versus gender

	Increased	No Change	Decreased
Male	58.0%	37.5%	2.5%
Female	74.7	22.8	1.9
Total Surveyed	60.0	35.7	2.4

SOURCE: Food Engineering 1986 Salary Survey

Most of the women *FE* surveyed were in technical jobs, purchasing, and/or "Other." Most are in lower paying jobs, too, with 87.9% making less than $45,000 and only about 12% making more. Women generally lose out, also, on bonuses and incentive pay.

For a sales manager in Missouri, that means *currently* earning $10,000 per year less than the man she replaced 2½ years ago. "Plus," she adds, "he had a company car." Still, she appreciates the chance her company has given her to better herself.

Her optimism is shared by many others. For example, 76.6% of the women surveyed were optimistic, compared to 75.1% of the men. Likewise, 20.3% of the women were pessimistic, compared to 19.3% of the men. Sometimes it's hard to see a bright side.

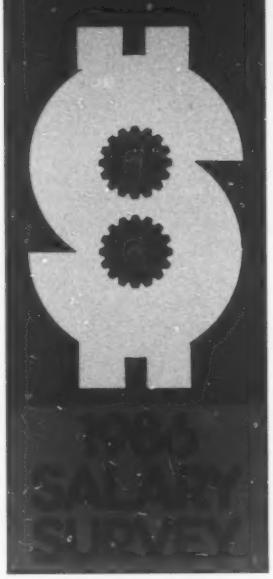
A shift superintendent in Pennsylvania, earning $27,400 per year after 27 years, complains that "Male employees doing exactly the same job on the same shift are getting paid higher salaries." And a food technologist in Minnesota says that "More demands are put on working mothers, yet benefits do not increase at the same rate."

Geography has little to do with this viewpoint, though most of the women seem to work in metropolitan areas—the Mid- and South Atlantic, North Central and Pacific areas. Also, women appear to be less likely (11.4%) to work in a small company, and more likely (48.8%) to work in a mid-sized company. Wherever they work, however, the women feel that they aren't being given an equal chance to get ahead.

A manager of R&D says: "In our corporation, our only female director is in a traditionally female area of consumer services." And a purchasing manager laments that her firm hires "mostly higher-paid outsiders for jobs higher up the ladder."

But that may be changing. As the "gender" table with this article shows, part of the problem may be related to how long women remain in the workforce. The evidence seems to indicate that women do much better as they achieve seniority.

"I do find that in a few organizations, being a women still closes some doors," sums up a technical manager. "Overall, though, I feel very positive about the food industry."



Median salaries by company size

Number of Employees	Salary Median
Under 20	$39,000
20-49	36,000
50-99	36,000
100-249	38,000
250-499	41,000
500-999	41,000
1,000-2,499	42,000
2,500 or More	45,000
All Firms	$41,000

SOURCE: Food Engineering 1986 Salary Survey

How salaries compare to responsibilities

	Increased	Same	Decreased
Salary	78.9%	15.7%	1.2%
Responsibility	60.0	35.7	2.4

SOURCE: Food Engineering 1986 Salary Survey

tance and chance for advancement." Another Oregon food technologist explains: "At our company, the opportunities for individual achievement are limited only by your willingness to put out extra effort."

Morale is a personal thing

Where optimism and pessimism is concerned, the region of the country in which you work doesn't seem to be significant. Nor is the size of the company a factor, although those in smaller firms appear to be slightly more optimistic. Moreover, the responses tend to fall into a similar pattern as those for whether or not the quality of life in the workplace is improving or worsening.

Length of service isn't a significant factor in employee optimism. And neither is the branch of the food industry in which you work. And gender doesn't seem to mean very much either. For example, 76.6% of the women surveyed were optimistic, compared to 75.1% of the men surveyed. Likewise, 20.3% of the women were pessimistic, compared to 19.3% of the men.

Although 48.4% of respondents gave no reason for their optimism, those who did emphasized faith in their company, the industry and their own ability to get ahead. For example, one cause cited by 9.6% of the optimistic group was that their company was expanding and/or growing. Confidence in their own ability to find another job was noted by 9.5%. Other reasons included: the opportunity for advancement is promising (5.5%); the company is good/progressive (5.1%); and the industry is growing (3.7%).

Generally, the reasons given for pessimism were the opposite, led by a lack of faith in the company, the industry and in themselves. And "no chance for advancement" was a leading reason. Among this pessimistic group, those with five or fewer years of experience and those with 10-19 years experience were nearly twice as likely to view the future with caution.

A bakery sanitarian with more than 30 years experience, for example, is extremely discouraged. "I feel I'm spinning my wheels," he says. "There are no real improvements in machinery or efficiency. It comes off the backs of the good workers." He blames fewer people and more work, longer hours and less pay for the lower morale.

There were a great number of references to stress and pressure on the job, too. Having too much to do, too little time to do it, and too little pay for your efforts takes its toll. This problem is being recognized, however. A purchasing manager in Tennessee points out that "Companies are becoming aware of stress in their managers and workers. But I believe more needs to be done for production employees."

A vice president of manufacturing for a firm in Arizona agrees, and adds: "The food industry has always paid less than other industries, but we've come a long way in the last few years. And salaries are going to keep getting better."

Median salaries by geographic location

Geographic Region	Median Salary	Geographic Region	Median Salary
Mid-Atlantic	$42,000	West North Central	40,000
West South Central	42,000	South Atlantic	39,000
Pacific	42,000	Mountain	39,000
New England	41,000	East South Central	38,000
East North Central	41,000	All Regions	$41,000

SOURCE: Food Engineering 1986 Salary Survey

Special Emphasis

DAIRY INGREDIENTS

EXPANDING USES OF MILK PROTEINS

Both the development of new and more functional milk proteins, and consumers' concerns for improved health are responsible for the increased use of milk proteins in foods.

ANN E. PRZYBYLA
Technical Editor

The resourcefulness of food scientists is especially apparent when it comes to dairy ingredients. New products such as highly purified whey protein isolates, milk protein hydrolysates to produce improved foams, and pH-stable sodium caseinates for emulsifying creamy juice beverages are aiding food processors in the engineering of new food products.

Most cheese in the U.S. is made by batch processing. Milk contains fat, casein and whey proteins, lactose, minerals, and water. Acid and/or enzyme treatment of milk results in the separation of curd (the fat, and some of the lactose, water, and minerals trapped by the coagulation of the casein) and whey (the remaining liquid with lactose, the whey proteins, minerals, and other minor constituents dissolved in it). The curd is further processed into cheese, with the whey remaining.

Since the 1960s milk proteins have been produced commercially for use as food ingredients. Whey, or serum protein, constitutes 20 percent of the proteins in milk. They differ from each other significantly in their molecular, physical, and functional properties. However, they are soluble at pH 4.6, whereas caseins precipitate out at this pH.

By heating whey at 180°F for 20 minutes, the whey proteins can be precipitated out. But a major advance in dairy ingredients came in the 1970s when ultrafiltration (UF) was used to concentrate whey proteins. The lower level of heat used in the process allows the recovery of whey proteins in a soluble form with better retention of nutritional and functional qualities. In the ultrafiltration process, whey is passed across a selective semi-permeable membrane. High mo-

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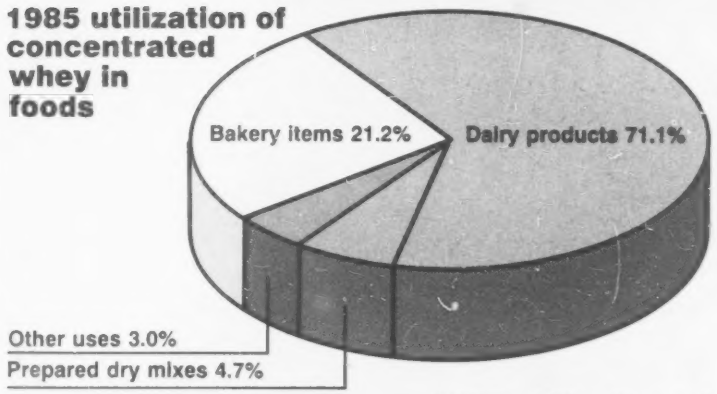
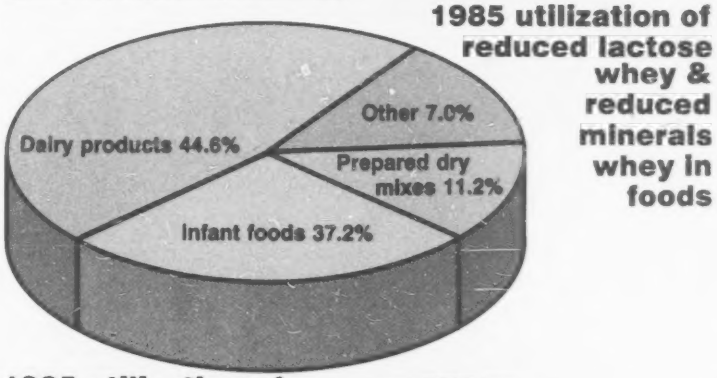
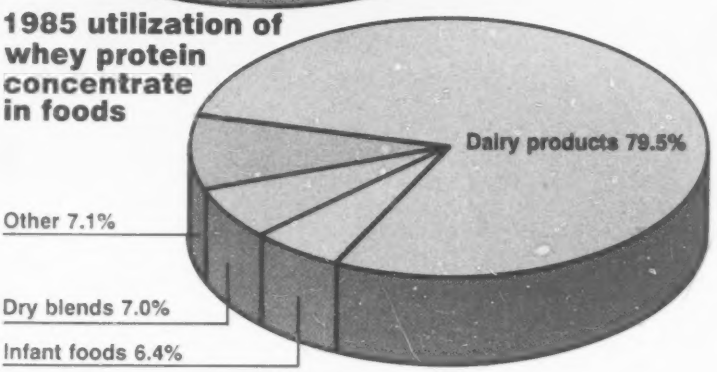



1985 utilization of reduced lactose whey & reduced minerals whey in foods
Other 7.0%
Dairy products 44.6%
Prepared dry mixes 11.2%
Infant foods 37.2%



As the functionality of whey ingredients is improved, new applications are developed. The figures in these charts are based on a compilation of whey products usage through direct sales of manufacturers. The survey – conducted by the Whey Products Institute (WPI) – included WPI members, other cooperating processors, and resellers. It reflects approximately 86 percent of the USDA reported whey solids processed during 1985. 1986 figures will be available later this year.

lecular weight protein molecules (or whey protein concentrates) are retained on the membrane, while low molecular weight minerals and lactose particles (or modified whey solids) pass through the membrane.

Whey protein concentrates (WPC) are 50 to 80 percent protein. Their uses include: Protein fortification; as a filler to add bulk; as a bodying agent in drinks; and to help in areation of bakery products. Since whey proteins are sensitive to heat, they are often used in dry mixes. Since they do not precipitate in acidic environments, they are recommended for use in beverages which do not undergo high temperature processing.

Other applications and benefits of WPC include:

• *High solubility at any pH.* Therefore, WPC functions well as emulsifiers in salad dressings, dips, and sauces.

• *High water binding capacity of protein gel after heating in processed meats.* The gel strength varies on the amount of WPC used, the time/temperature conditions of processing, and any interaction with other ingredients used.

• *Possible reduction of cholesterol content by more than 50 percent when used as a milk or egg solids replacer in products such as quiche.* In these applications, WPC also eliminates inherent microbiological and handling problems innate to milk and eggs, in addition to offering a cost savings.

• *A well balanced amino acid content.*

Isolates 90% protein or more

Ultrafiltration increases the protein content of whey to approximately 60 percent protein. A di- or second filtration is used to produce concentrations as high as 80 percent protein whey. But recently, proprietary processes have been developed to further concentrate whey to 90 percent protein or higher. These products are referred to as whey protein isolates. Both Dairy Specialties and Le Sueur Isolates, Le Sueur, MN, offer whey protein isolates. (The photograph on the front page of this article is of *BiPRO* – whey protein isolate from Le Sueur Isolates).

Bio-Isolates, from Le Sueur Isolates, are produced by the use of ion exchange adsorption with specially developed high performance hydrophilic ion exchangers patented by the company. While any proteinaceous food process stream can be used as feedstock for the process, to date the company has focused on developing whey protein isolate from cheese whey. After concentrating through ultrafiltration and spray drying, a 95 percent whey protein isolate results.

Due the the higher cost of whey protein isolates over other whey products, they are recommended for applications requiring a low level of fat and lactose, and high protein fortification needs. Suggested applications include: sodium free ice cream; egg replacements that do not need to be refrigerated; and protein reinforced drinks with no off-flavor.

Altered by hydrolysis

One way in which milk proteins are modified to provide specific properties is through hydrolysis. New Zealand Milk Products, Petaluma, CA, has developed *Milk Protein Hydrolysate 985* for use as a whipping

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agent. It is designed to be easily dispersed at high solids. And unlike some whipping agents that may require time for hydration prior to use, it disperses immediately.

The primary role of a whipping agent in aerated desserts and confections is to: Entrap the air being introduced into the mix; produce a uniform dispersion of the air cells within the product; lower the specific weight of the products; and provide considerable modification of the texture, explained Deborah A. Rolf, food scientist at New Zealand Milk Products. Egg albumen has the longest history of use as a whipping agent in the food industry, but fluctuating and often high price is a concern.

A comparative study of several commercial whipping agents and Milk Protein Hydrolysate 985 was conducted by the manufacturer. Whipping overrun, foam stability, and final nougat density were determined for each product. Whipping overrun is a measurement of the amount of air that has been incorporated into the mix and foam. Stability is a measurement of the time in

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As the popularity of cheese increases, food processors are incorporating it in more processed foods. Photo courtesy of Borden Corp.

New cheeses increase usage

Cheese is back in vogue! New and expanding choices of cheeses—especially Italian styles and gourmet cheeses—were a major force in the increased consumption of cheese last year.

U.S. manufacturers of cheese saw a 5.5 percent increase in sales to $10.7 billion in 1965, according to Commack, NY-based Business Trend Analysts' new report—*The U.S. Cheese Market: A product-by-product marketing analysis and competitor profile*. The report continues to point out that per capita consumption of both imported and domestic cheese increased to 24.0 pounds, and is expected to total 25.4 pounds this year.

"Processed and imitation (or substitute) cheese products did not have the outstanding appeal for which industry affiliates had hoped, even in light of their reductions in calories, cholesterol, and sodium," continued the report. "Natural cheeses (excluding cottage cheese) totaled about $6.4 billion in U.S. manufacturers' sales in 1985 and are projected to grow at an average annual rate of 10 percent through 1995. In terms of sales, natural cheeses comprised 60 percent of the total cheese figure in 1985."

One particular category of cheeses which continues to grow in popularity is Italian cheeses. Per capita consumption in this category of cheese has grown from 3.3 pounds to 5.8 pounds during the last decade, according to another BTA report on dairy products.

Among the more popular Italian cheeses are mozzarella and ricotta. The use of ricotta has grown as the "pizza generation" has discovered the appeal of other Italian entree and dessert items, points out Phil Fass of Universal Foods Corp. But the popularity of pizza also has been a major factor in increased cheese consumption—especially its use on frozen pizzas and in food service operations (see *Food Engineering*, Oct. 1986, p. 12).

New products in this area have been developed to aid food processors using these popular Italian cheeses. Normally characterized by high moisture and short shelf-life, a line of Italian speciality cheeses has been developed by Universal Food with the moisture content reduced to approximately four percent resulting in a longer shelf-life.

Another development is Hi-Melt Process Cheeses from Kraft Industrial Foods. Tests have shown that a two-inch cube of Hi-Melt held at a temperature of 300°F for 10 minutes retains its flavor and well-defined edges. Recommended uses include value-added Italian foods.

which the foam remains stable. The company's results showed significant functional and economical benefits by using Milk Protein Hydrolysate 985.

Modifications of caseins

Another commonly used dairy ingredient is caseinates, or modified forms of casein – the milk protein used in cheeses. Caseins are not produced in this country except for a limited government sponsored program to produce casein from excess skim milk. The reason for this is the cost would be prohibitive. Caseins are, however, produced in other parts of the world where government subsidiaries allow them to be sold for a competitive price.

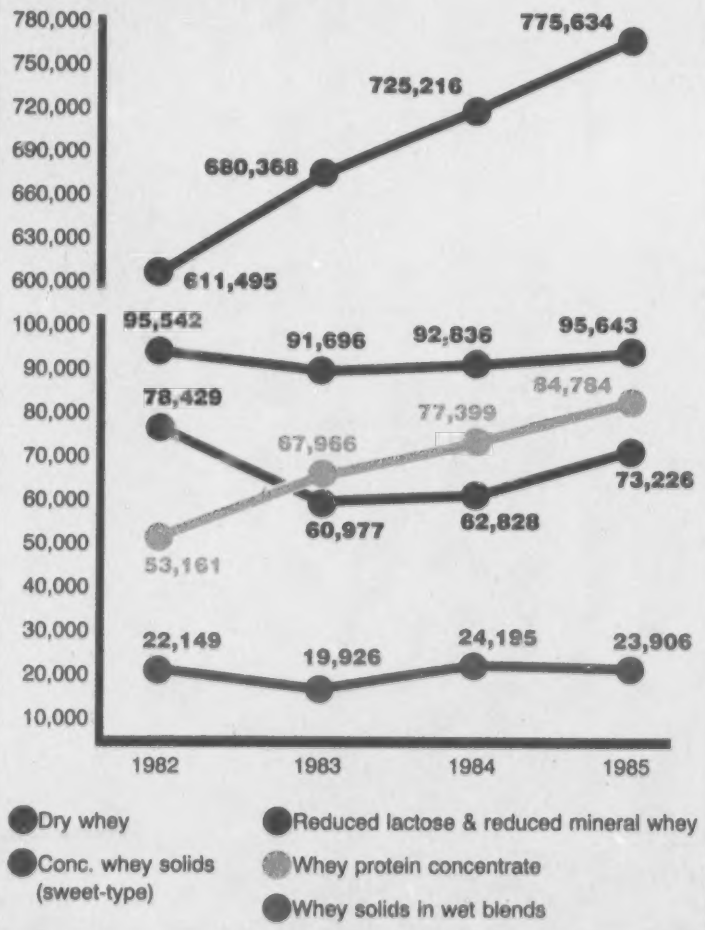
Casein can be isolated from milk by adjusting the pH to 4.6, or through the action of the enzyme rennet. Soluble caseinates are formed from caseins by either raising the pH and/or using sequestering agents. The functionality of the resultant caseinate can be manipulated by using different ions.

Sodium caseinate is highly viscous, a good film former, and a good emulsifier, points out Kurt L. Frey, manager – business development for New Zealand Milk Products. Recommended applications include whipped toppings and cream liqueurs. Calcium caseinate is less viscous and forms an opaque solution. A typical application would be a diet beverage where a low viscosity is desired. Potassium caseinates have similar properties to sodium caseinates but can have a bitter taste. They do have applications where reduced sodium is desired, and other flavors in the final food system help mask their taste.

Both high calcium whey protein concentrates and calcium caseinates offer a means to increase the calcium content of foods by using a milk-derived calcium source. And with the current concern among women in obtaining enough calcium in their diets, this could have positive marketing benefits.

Overall production of whey products has increased during the past several, although slight declines have occurred in specific types. These figures are based on a survey conducted by the Whey Products Institute and represents approximately 86% of the USDA reported whey solids processed during 1985. 1968 figures will be available later this year.

Production of whey & whey products for human food
(figures in thousands of pounds)



UF milk for cheese

While ultrafiltration of whey is fairly common in this country, ultrafiltration of milk prior to cheese making – which is becoming increasingly popular in Europe – is done only on a limited basis here. Labeling restriction in this country is the reason for this. The *Standards of Identity*, published by the U.S. Food and Drug Administration, were amended in 1985 to allow for certain cheeses made with UF milk. It does stipulate, though, that this cheese must be organoleptically and nutritionally equivalent to cheese made by traditional processes.

To date, the FDA has not sanctioned any cheese made from UF milk as organoleptically and nutritionally equivalent to traditional cheese. If FDA did, however, the supply of whey could be reduced. But, since the cost of converting a cheese plant from traditional cheese making to the UF process is very expensive, most likely only new cheese plants would be set up to manufacture cheese from UF milk.

So even *if* UF processed cheese becomes acceptable in this country, no dramatic changes would be seen in milk protein ingredients – at least not for a long time. Whey and other dairy ingredient will continue to provide numerous functions in foods such as film and gel former, thickener, water binding, emulsifier, offering freeze/thaw stability, and aid in providing the desired texture.